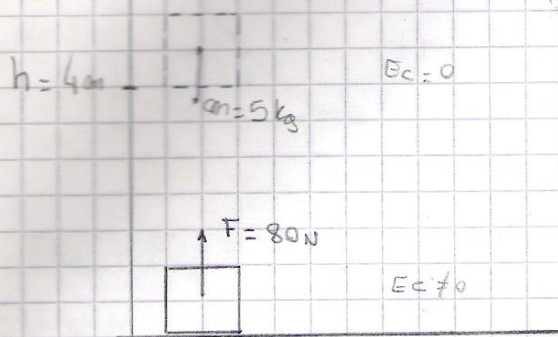


TRABAJO Y ENERGÍA: (PÁGINA 9)

①



a) $W_F = F \Delta y \cdot \cos \alpha \Rightarrow W = 80 \text{ N} \cdot 4 \text{ m} \cdot \cos 0^\circ \Rightarrow W_F = 320 \text{ J}$

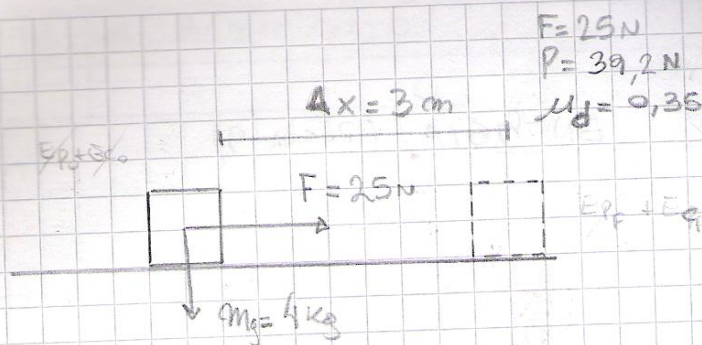
b) $W_p = P \cdot \Delta y \cdot \cos \alpha \Rightarrow W = 49 \text{ N} \cdot 4 \text{ m} \cdot \cos 0^\circ \Rightarrow W_p = 196 \text{ J}$

c) $W_{\text{net}} = \Delta E_c$

$$W_F - W_p = \frac{1}{2} m V_f^2 \Rightarrow \sqrt{\frac{320 \text{ J} - 196 \text{ J}}{\frac{1}{2} m}} = V_f$$

$V_f = 7,04 \text{ m/s}$ ✓

2



$$W_{FNC} = \Delta E_{cm}$$

$$\mu \cdot m \cdot g \cdot \Delta x \cdot \cos 180 = \frac{1}{2} m V_f^2$$

$$\sqrt{\frac{(-\mu \cdot m \cdot g) \Delta x \cdot \cos 180}{\frac{1}{2} m}} = V_f$$

$$V_f = 4,5 \text{ m/s}$$

EL RESULTADO REAL ES $V_f = 4,1 \text{ m/s}$
SI LO HAGO CON WATS.

$$W_F + W_{Frc} = \Delta E_{cm}$$

$$W_F - W_{Frc} = \frac{1}{2} m V_f^2$$

$$\sqrt{\frac{75 \text{ J} - 41,16 \text{ J}}{\frac{1}{2} m}} = V_f$$

$$V_f = 4,11 \text{ m/s}$$

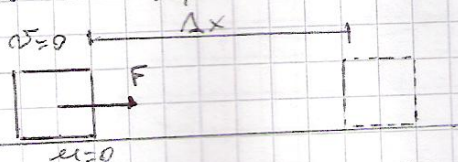
CONCORDA SEGÚN
LA GUIA

F y F_{rd} SON FUERZAS NO CONSERVATIVAS?

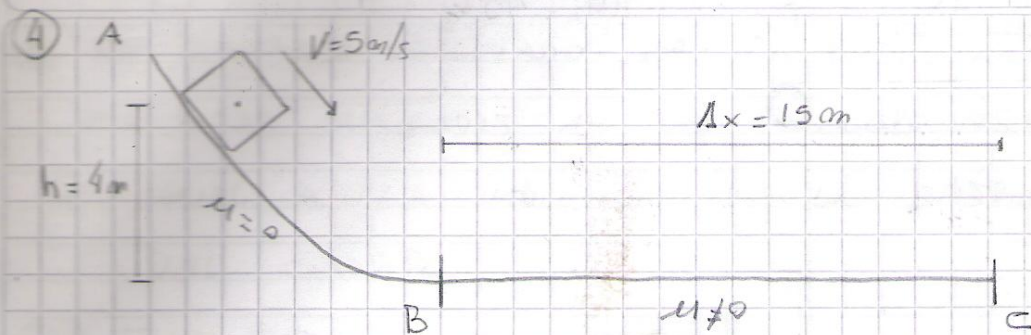
3

$$W_{WTS} = \Delta E_c$$

CUANDO VARIAS FUERZAS ACTUAN SOBRE UN CUERPO, Y
GENERAN UNO ÚNICO DESPLAZAMIENTO, SE DICE QUE EL TRABAJO
RESULTANTE DE LAS MISMAS ES IGUAL AL CAMBIO
DE LA ENERGÍA CINÉTICA DEL CUERPO.



$$W_{WTS} = \Delta E_c \Rightarrow F \cdot \Delta x \cos 0 = \frac{1}{2} m V_f^2 - \frac{1}{2} m v_0^2 \Rightarrow F \cdot \Delta x \cos \alpha = \frac{1}{2} m V_f^2$$



$\mu = ?$

$$E_{m_A} = E_{m_B}$$

$$W_{FNC} = E_{mf} - E_{m_0}$$

$$W_{FNC} = -E_{m_0}$$

$$\mu \cdot N \cdot \Delta x \cos 180 = -(m \cdot g \cdot h + \frac{1}{2} m v^2)$$

$$(\mu \cdot g \cdot \Delta x) = -\left(g \cdot h + \frac{1}{2} v^2\right)$$

$$\mu = \frac{g \cdot h + \frac{1}{2} v^2}{g \cdot \Delta x} \Rightarrow \mu = \frac{9,8 \text{ m/s}^2 \cdot 4 \text{ m} + \frac{1}{2} \cdot 25 \text{ m}^2/\text{s}^2}{9,8 \text{ m/s}^2 \cdot 15 \text{ m}}$$

$$\mu = \frac{39,2 + 12,5}{147} \Rightarrow \mu = 0,35 \quad \checkmark$$

BREVE EXPLICACIÓN:

- Por FUERZAS CONSERVATIVAS, LA ENERGÍA MECÁNICA EN A ($E_{PA} + E_{CA}$) ES IGUAL A LA DE B (E_{CB}).
- Por FUERZAS NO CONSERVATIVAS, TENEMOS QUE

$$W_{FNC} = \Delta E_m$$

ENTONCES

$$W_{FNC} = E_{m_C} - E_{m_A}$$

$$\downarrow$$

$$E_{mf} - E_{m_0}$$

ACLARACIÓN

TAMBIÉN SE PUEDE USAR

$$W_{FNC} = \Delta E_c \Rightarrow W_{FNC} = E_{c_C} - E_{c_A}$$

PERO ANTES SE DEBE

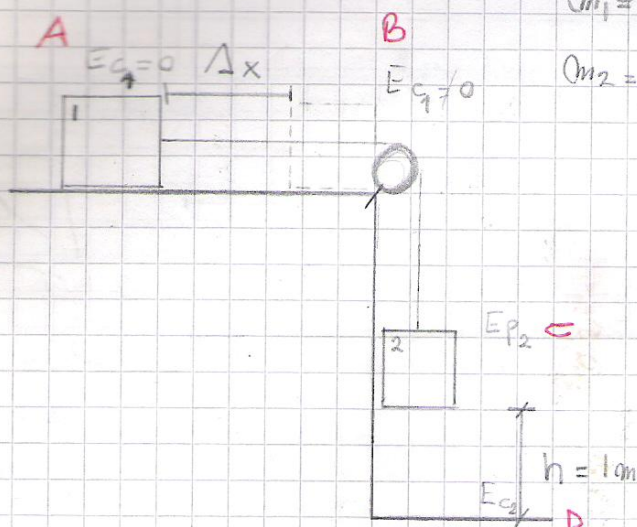
CALCULAR v_B .

$$v_B \Rightarrow E_{m_A} = E_{m_B} \Rightarrow E_{PA} + E_{CA} = E_{CB}$$

REEMPLAZO LOS VALORES Y RESUELVO.

$$V_f^2 = V_0^2 + 2 \cdot g \cdot \Delta x \Rightarrow$$

5



$$m_1 = 150 \text{ kg}$$

$$V_f = ?$$

$$m_2 = 40 \text{ kg}$$

$$W = \Delta E_{\text{m}} \Rightarrow W = E_{\text{mf}} - E_{\text{mi}}$$

PARA m_1

$$0 = E_{\text{mf}} - E_{\text{mi}} \Rightarrow E_{\text{mi}} = E_{\text{mf}}$$

$$E_{\text{mi}} = E_{\text{CB}}$$

$$E_{\text{PC}} = E_{\text{CB}} + E_{\text{CD}}$$

PARA m_2

$$m_2 \cdot g \cdot h = \frac{1}{2} m_1 V_f^2 + \frac{1}{2} m_2 V_f^2$$

$$E_{\text{mi}} = E_{\text{PC}} + E_{\text{CD}}$$

$$m_2 \cdot g \cdot h = V_f^2 \left(\frac{1}{2} m_1 + \frac{1}{2} m_2 \right)$$

$$\sqrt{\frac{m_2 \cdot g \cdot h}{\frac{1}{2} m_1 + \frac{1}{2} m_2}} = V_f \Rightarrow V_f = \sqrt{\frac{400}{75 + 20}} \Rightarrow \boxed{V_f = 2,05}$$

ACLAARACIÓN:

$W = 0$ por que $\alpha = 90^\circ$ ($\cos 90 = 0$), NO HAY TRABAJO REALIZADO, NO HAY FUERZAS NO CONSERVATIVAS.

9

A $k_A > k_B$

$$k_A = 1000$$

$$E_{Pe} = \frac{1}{2} k x^2$$

$$F_e = k \cdot x$$

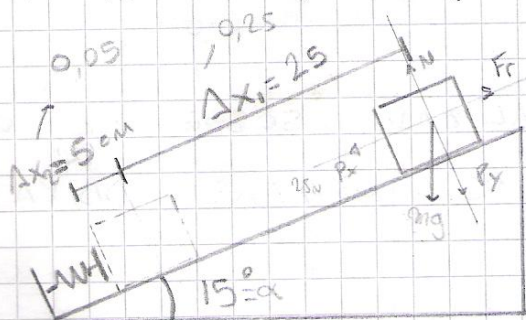
B $k_B < k_A$

$$k_B = 100$$

a) Si $\Delta x_A = \Delta x_B \Rightarrow W_A > W_B$

b) Si $F_A = F_B \Rightarrow W_A < W_B$ Porque $\Delta x_A < \Delta x_B$

10



$$m = 10 \text{ kg}$$

$$\alpha = 15^\circ$$

$$k = 1600 \text{ N/m}$$

SOH CAR TOA

$$\text{Sen } 15, 30 = h$$

$$h = 7,76 \text{ cm}$$

$$0,077$$

$$u_e = ?$$

$$u_d = ?$$

$$v_f^2 = v_0^2 + 2g \Delta x$$

a) $\sum F_x = m \cdot a$

$$P_x - F_{re} = m \cdot a$$

$$m g \cdot \text{Sen } \alpha = \mu \cdot m g \cdot \text{Cos } \alpha \Rightarrow \mu = \frac{\text{Sen } \alpha}{\text{Cos } \alpha} \Rightarrow \mu = \text{tg } \alpha \Rightarrow \mu = 0,26$$

b) $W_{FNC} = \Delta E_m \Rightarrow \mu d \cdot m g \cdot \text{Cos } \alpha \cdot \Delta x_f \cdot \text{Cos } 180^\circ = \frac{1}{2} k \Delta x_2^2 - m g h$

$$\mu d \cdot \frac{96,59 \text{ N} \cdot 0,25 \cdot (-1)}{24,23 \text{ m}} = \frac{2}{-7,7} + 5,7$$

$$\mu d = \frac{5,7}{24,23} \Rightarrow \mu d = 0,23$$

100 - 1 an
5

$$y = y_0 + v_{0y} t + \frac{1}{2} g t^2 \Rightarrow y = \frac{1}{2} g t^2$$

II

$V_0 = ?$

$r = 1m$

A $\begin{cases} E_p \neq 0 \\ E_c \neq 0 \end{cases} \rightarrow E_{m0}$

Para V_0

$$F = m \cdot a \Rightarrow m g = m \frac{V_0}{r}$$

$$\Rightarrow V_0 = \sqrt{g \cdot r} = V_0 = 3,16$$

$$|V_0 = 3,16|$$

$V_f = ?$

B $\begin{cases} E_p = 0 \\ E_c \neq 0 \end{cases} \rightarrow E_{mf}$

$$W_{FNC} = \Delta E_m \Rightarrow W_{FNC} = E_{mf} - E_{m0}$$

COMO EL SISTEMA CARECE DE FUERZAS NO CONSERVATIVAS...

$$W_{FNC} = 0 \Rightarrow E_{m0} = E_{mf}$$

$$m \cdot g \cdot h + \frac{1}{2} m V_0^2 = \frac{1}{2} m V_f^2$$

$$g h + \frac{1}{2} V_0^2 = \frac{1}{2} V_f^2$$

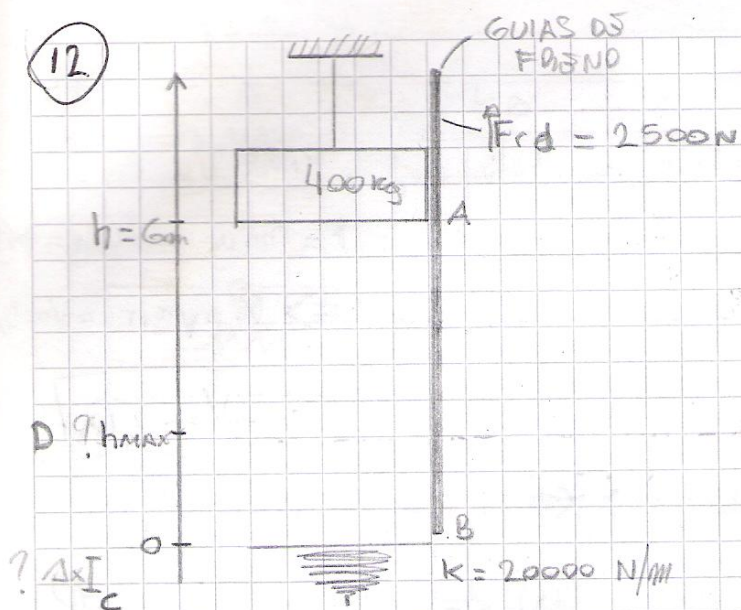
$$\sqrt{\frac{g \cdot h + \frac{1}{2} V_0^2}{\frac{1}{2}}} = V_f \Rightarrow \sqrt{\frac{9,8 \cdot 2m + 4,99}{\frac{1}{2}}} = V_f$$

$$\Rightarrow V_f = \sqrt{\frac{24,59}{0,5}} \Rightarrow |V_f = 7,01 \text{ m/s}|$$

$V_0 = V_{ARRIBA}$

$V_f = V_{ABAJA}$

12



$$V_B = ?$$

$$\Delta x = ?$$

$$h_{max} = ?$$

$$2) A = E_{PA}; B = E_{CB}$$

$$W_{FNC} = \Delta E_{cm}$$

$$F_{cd} \cdot h \cdot \cos 180 = \frac{1}{2} m V_B^2 - m g h$$

$$\sqrt{\frac{-F_{cd} \cdot h + m g h}{\frac{1}{2} m}} = V_B \Rightarrow \sqrt{\frac{9000 \text{ N/m} \cdot h}{200 \text{ kg}}} = V_B \Rightarrow V_B = 6,70 \text{ m/s}$$

$$b) B = E_{PB} + E_{CB}; C = E_{PC}$$

Por WFC (CONSERVACIÓN DE ENERGÍA)

$$E_{mgs} = E_{mcs}$$

$$m \cdot g \cdot \Delta x + \frac{1}{2} m V_B^2 = \frac{1}{2} k \Delta x^2$$

$$\underbrace{-\frac{1}{2} k \Delta x^2}_A + \underbrace{m g \Delta x}_B + \underbrace{\frac{1}{2} m V_B^2}_C = 0$$

$$-10000 \Delta x^2 + 4000 \Delta x + 8978 = 0$$

$$\frac{-B \pm \sqrt{B^2 - 4 \cdot A \cdot C}}{2 \cdot A} \Rightarrow \Delta x_1 =$$

$$\Delta x_2 =$$

$$\frac{-4000 \pm \sqrt{16000000 - (4 \cdot (-10000) \cdot 8978)}}{-20000}$$

$$\frac{-4000 \pm \sqrt{16000000 + 35912000}}{-20000} = \frac{-4000 \pm 19368}{-20000} = \begin{cases} \Delta x_1 = 1,6 \text{ m} \\ \Delta x_2 = -0,76 \end{cases}$$

25000 - 6400

$$V_f = V_0 + a \cdot \Delta x$$

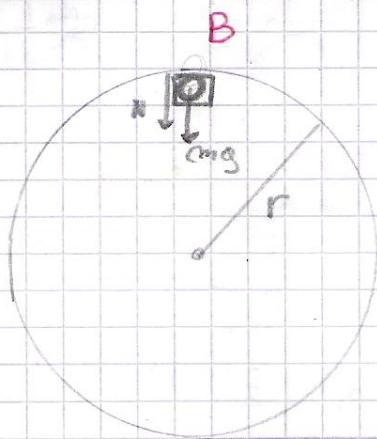
$$\textcircled{C} W_{FNC} = \Delta E_{\text{m}} \Rightarrow W_{FPC} = E_{\text{mD}} - E_{\text{mB}}$$

$$D = EP; B = EC$$

$$-F_{rd} \cdot h_{\text{max}} = m g h_{\text{max}} - \frac{1}{2} m V_B^2 \Rightarrow h_{\text{max}} (-F_{rd} - m g) = \frac{1}{2} m V_B^2$$

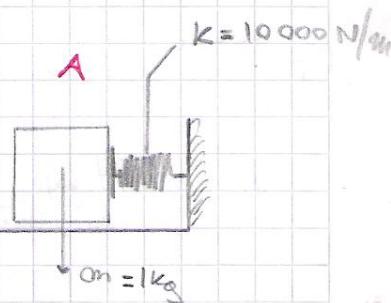
$$h_{\text{max}} = \frac{-(\frac{1}{2} m V_B^2)}{(-F_{rd} - m g)} \Rightarrow h_{\text{max}} = \frac{-(8978)}{-6500} \Rightarrow h_{\text{max}} = 1,38 \text{ m} \quad \checkmark$$

13



$$r = 1 \text{ m}$$

$$V = \sqrt{g \cdot r} \Rightarrow V = 3,13 \text{ m/s}$$



Por W_{FC} (CONSERVACIÓN DE ENERGÍA)

$$E_{\text{mD}} = E_{\text{mF}} \Rightarrow E_{\text{mD}} = E_{\text{mB}}$$

$$A = EP; B = \begin{cases} EP \\ EC \end{cases}$$

$$\frac{1}{2} K X^2 = m g 2r + \frac{1}{2} m V_B^2 \Rightarrow \sqrt{\frac{m g 2r + \frac{1}{2} m V_B^2}{\frac{1}{2} K}} = \Delta x$$

$$\Delta x = \sqrt{\frac{20 + 4,89}{5000}} \Rightarrow \Delta x = 0,07 \text{ m} \quad (7 \text{ cm}) \quad \checkmark$$

$$F = m \cdot a$$

$$a_c = \frac{V^2}{r}$$

$$N + m/g = m \cdot \frac{V^2}{r} \Rightarrow N = 0$$

$$g = \frac{V^2}{r}$$

$$\sqrt{g \cdot r} = V \quad \checkmark$$

$$\textcircled{15} \quad \omega = \frac{P}{F} \Rightarrow \omega = \frac{14 \text{ W}}{5 \text{ N}} \Rightarrow \omega = 2,8 \text{ m/s} \quad P = 14 \text{ W}$$

$$P = \frac{W}{\Delta t} \Rightarrow W = P \cdot \Delta t$$

$$F = 5 \text{ N}$$

$$\Delta t = 7 \text{ s}$$

$$\Rightarrow W = 14 \text{ W} \cdot 7 \text{ s}$$

$$\Rightarrow W = 98 \text{ J} \quad /$$

CHOQUE

①

$$V_1 = 6 \text{ m/s}$$

$$V_2 = 3 \text{ m/s}$$

$$V_1' = ? \quad \text{D'APRÈS} \quad V_2' = ?$$



$$m_1 = 4 \text{ kg}$$

$$m_2 = 6 \text{ kg}$$

$$k = 0$$

$$m_1 V_1 + m_2 V_2 = (m_1 + m_2) V_1'$$

$$\textcircled{1} \quad m_1 V_1 + m_2 V_2 = (m_1 + m_2) V_1'$$

$$V_1' = \frac{m_1 V_1 + m_2 V_2}{m_1 + m_2} \Rightarrow V_1' = \frac{24 \text{ kg m/s} + 18 \text{ kg m/s}}{10 \text{ kg}} \Rightarrow V_1' = 4,2 \text{ m/s}$$

$$\Delta E_c = E_{cf} - E_{ci}$$

$$\frac{1}{2} (m_1 + m_2) V_f^2 - \left(\frac{1}{2} m_1 V_{1i}^2 + \frac{1}{2} m_2 V_{2i}^2 \right) = \Delta E_c$$

$$(5 \text{ kg} \cdot 17,64 \text{ m/s}^2) - (72 \text{ kg m/s}^2 + 27 \text{ kg m/s}^2) = \Delta E_c$$

$$88,2 - 99 = \Delta E_c$$

$$\Delta E_c = 10,8 \text{ J} \quad /$$